Teton River Subbasin Assessment
And
Total Maximum Daily Load

Photo courtesy of Timothy Randle, Bureau of Reclamation

Department of Environmental Quality

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BIOLOGICAL CHARACTERISTICS OF THE TETON SUBBASIN

Vegetation

The Teton Subbasin is located within the Snake River Basin/High Desert ecoregion and Middle Rockies ecoregion of the Pacific Northwest (Omernik and Gallant 1986). The boundary between these ecoregions corresponds approximately to the boundaries between privately owned agricultural lands and lands managed by the U.S. Forest Service. The natural plant communities of the Snake River Plain/High Desert ecoregion are sagebrush steppe (i.e., sagebrush and wheatgrass) and saltbush/greasewood. In the Teton Subbasin, native plants on uplands that have largely been converted to crop production include bluebunch wheatgrass, Sandberg bluegrass, Idaho fescue, and sagebrush (USDA 1969 and 1981).

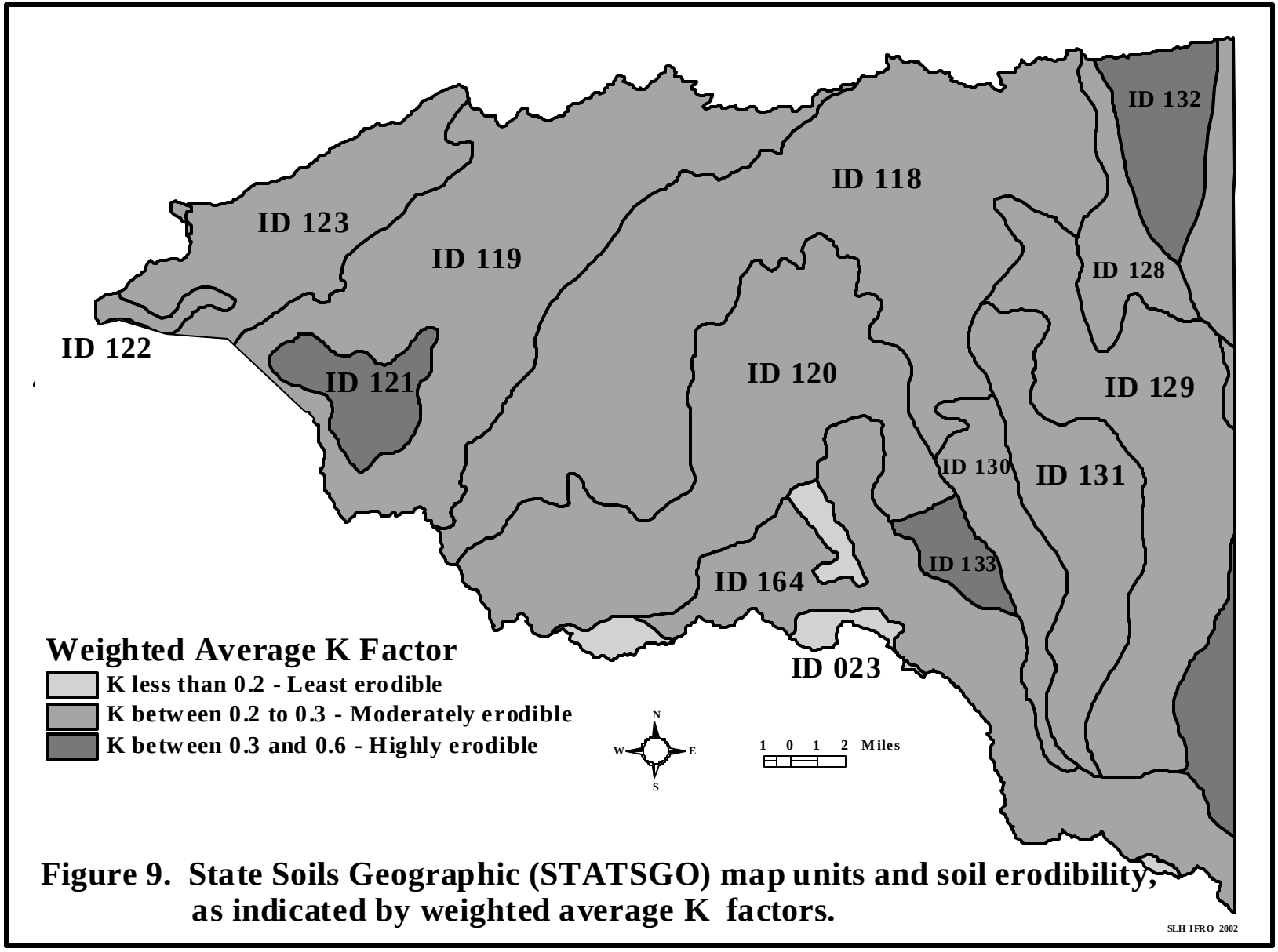

Figure 9. State Soils Geographic (STATSGO) map units and soil erodibility, as indicated by weighted average K factors.

The potential natural vegetation of the Middle Rockies ecoregion is Douglas fir,western spruce-fir, and alpine meadow plant communities. On portions of the Caribou-Targhee National Forest that occur within the Teton Subbasin in Idaho, lodgepole pine and Douglas fir communities dominate the forested landscape. In the Teton subsection of the forest, Douglas fir is increasing through succession, and conifers are invading riparian areas and mountain meadows due to fire suppression (USDA 1997b). Detailed information regarding plant communities on the forest is contained in the *Targhee National Forest Ecological Unit Inventory* (Bowerman *et al.* 1999).

A defining feature of the Teton Subbasin is the extensive wetland complex associated with the upper Teton River. In 1993, the U.S. Fish and Wildlife Service published an atlas of National Wetlands Inventory maps for Teton County using aerial photographs taken in 1980 (Peters *et al.* 1993). Nine percent of Teton County was identified as wetlands, and almost all of the wetlands (26,757 acres) were located in the Teton Valley in an area bounded by the Teton River on the west, Highway 33 on the east and north, and Highway 31 on the south. East and north of Highway 33, wetlands were mapped in the Trail Creek, Teton Creek, South Leigh Creek, Spring Creek, and Badger Creek subwatersheds.

On the Caribou-Targhee National Forest, aquatic influence zones associated with waterbodies and wetlands are managed to provide a high level of aquatic protection and maintain ecological functions. Mass wasting has been identified as the principal ecological concern affecting riparian quality in both the Teton and Big Hole Mountains subsections of the forest. Principal management concerns affecting riparian quality include high levels of dispersed recreation, horse, and off-highway vehicle use; trails and roads in close proximity to or within riparian areas and associated stream crossings; and areas of overuse by domestic and wild ungulates (USDA 1997a). Wildlife management indicator species associated with riparian and aquatic habitats in the Teton Subbasin include the spotted frog and harlequin duck; the indicator species for fisheries is the Yellowstone cutthroat trout (USDA 1997b). One of the objectives specified in the *1997 Revised Forest Plan for the Targhee National Forest* (USDA 1997a) for fisheries, water and riparian resources in the Teton Subbasin is to improve stream channel stability ratings to good or excellent by 2007 on the following streams where natural conditions allow improvement: Teton Creek, North Leigh Creek, Fox Creek, Kiln Creek, Packsaddle Creek, Horseshoe Creek, Superior Creek, North Fork Mahogany Creek, Mahogany Creek, Henderson Creek, Patterson Creek, and Murphy Creek.

Fisheries

Salmonid species indigenous to the Teton Subbasin include cutthroat trout (*Oncorhynchus clarki*) and mountain whitefish (*Prosopium williamsoni)*. Salmonids introduced to the Snake River drainage and commonly found in the Teton Subbasin include rainbow trout (*Oncorhynchus mykiss sp.*) and brook trout (*Salvelinus fontinalus*), although the Forest Service reports that brown trout (*Salmo trutta*) and lake trout (*Salvelinus namaycush*) also occur in the subbasin (USDA 1997a). Non-salmonid species known to occur in the subbasin include sculpin (*Cottus sp.*), longnose dace (*Rhinichthys cataractae*), speckled dace (*Rhinichthys osculus*), Utah sucker (*Catostomus ardens*), Utah chub (*Gila atraria*), and redside shiner (*Richardsonius balteatus)* (USDA 1997a, DEQ data).

The Yellowstone cutthroat trout (*Oncorhynchus clarki bouvieri*) is the only trout subspecies indigenous to the Teton Subbasin. Historically, the Yellowstone cutthroat trout occurred throughout the Snake River drainage upstream of Shoshone Falls (Behnke 1992, as cited in Gresswell 1995) but currently occupies only 45 percent of its historic range in Idaho (USDA 1997b). It is recognized as a species of special concern by the Idaho Department of Fish and Game (IDFG), which means the species is either low in numbers, limited in distribution, or has suffered significant population reductions due to habitat losses (IDFG 1996). The U.S. Fish and Wildlife Service (USFWS) was petitioned to list the Yellowstone cutthroat trout as threatened under the Endangered Species Act, but in February 2001, USFWS concluded that the petition did not provide substantial biological information to indicate that listing was warranted.

The decline of Yellowstone cutthroat trout throughout its range has been attributed primarily to hybridization resulting from introductions of rainbow trout and nonnative stocks of Yellowstone and other subspecies of cutthroat trout (Gresswell 1995). In the Teton Subbasin, reproductive isolation between cutthroat and rainbow trout has apparently prevented hybridization in most areas (Schrader 2000a). Yellowstone cutthroat trout spawn in tributaries of the Teton River, whereas rainbow trout spawn in the mainstem of the river (Schrader 2000a). Research in another eastern Idaho subbasin indicated that Yellowstone cutthroat trout spawn in headwater reaches of tributary streams in May and June, whereas rainbow trout spawn in lower reaches from winter through spring (Thurow 1982, as cited in Gresswell 1995).

Preservation of the genetic integrity and population viability of wild native cutthroat trout was the first objective of the IDFG 1996-2000 fisheries management plan for the Teton River drainage (IDFG 1996). This effort began in 1988 when the IDFG initiated the Teton River Fishery Enhancement Program to improve angling opportunities by restoring fish habitat lost following collapse of the Teton dam and due to cumulative changes in land use practices. According to the *1996-2000 Fisheries Management Plan* (IDFG 1996), the river supported a self-sustaining cutthroat trout fishery prior to collapse of the dam. More than half of the population was concentrated below the dam site, approximately 30 percent was concentrated within the canyon, and approximately 20 percent was concentrated in the upper valley. The overall catch rate for cutthroat trout in 1974 and 1975 was 1.34 and 1.31 fish/hour, but in 1980 the catch rate had fallen to 0.74 fish/hour. Projects to improve riparian habitat and reduce sediment delivery to the river and tributaries were initiated, fish passage at culverts and canal diversions was improved, stocking of rainbow trout outside enclosed impoundments was discontinued, and harvest of rainbow and brook trout was encouraged (IDFG 1996). A comprehensive report of enhancement program activities conducted from 1987 through 1999 is currently being written, and will include information regarding population surveys, fish movement, age and growth, whirling disease, black spot disease, fish stocking, creel surveys, habitat surveys, and habitat projects (Schrader 2000a).

A four-year study that focused on the Teton Canyon fishery was co-funded by the BOR and IDFG and concluded in 2000. An important feature of this study was the use of radiotelemetry to obtain information regarding fish life history, movement, and habitat use patterns. The preliminary results of the study are available as a progress report (Schrader 2000b), and some results are presented in subsequent sections of this report. Complementary studies of the geologic, geomorphic, and hydraulic conditions (Randle *et al.* 2000) and summer river water temperatures (Bowser 1999) of the Teton Canyon upstream from the Teton Dam site were also conducted by the BOR from 1997 to 1999. These studies are also discussed in greater detail elsewhere in this report.

In addition to long-term studies conducted by the IDFG, the Forest Service has conducted extensive surveys to document populations of Yellowstone cutthroat trout on the Caribou-Targhee National Forest. In 1998, the Forest Service conducted cutthroat trout population surveys in several streams in the Teton Subbasin. The Forest Service has also prepared a draft habitat conservation assessment for Yellowstone cutthroat trout, which is intended to define the habitat conditions necessary for long-term persistence of the species (USDA 1997b).

Recognizing the importance of Yellowstone cutthroat trout throughout the Henry's Fork basin, the Henry's Fork Watershed Council established a native trout subcommittee to enhance coordination and cooperation among all entities concerned with the status of cutthroat trout. The subcommittee is composed of representatives of state and federal resource agencies, private groups, water users, and independent scientists. The basic charter of the subcommittee is to 1) identify and assess populations of native trout in the Henry's Fork basin, 2) plan for native trout protection and restoration if needed, and 3) monitor recovery and overall health of identified cutthroat trout populations.

The potential success of efforts currently being expended by management agencies to bolster native cutthroat trout populations in the Teton Subbasin has been reinforced by the first quantitative analysis of the status of fisheries and aquatic habitats in the entire Greater Yellowstone Ecosystem. Van Kirk (1999) compiled and assessed information available for each of the eight-digit hydrologic units within the Greater Yellowstone Ecosystem, then quantified the current status of the native and nonnative populations of salmonids within each subbasin and the aquatic habitat and watershed integrity of the subbasin. The author concluded that although the abundance of native trout in the Teton Subbasin has been reduced due to habitat degradation, the distribution of native trout makes the Teton Subbasin one of seven subbasins in the Greater Yellowstone Ecosystem where significant opportunities for restoration of Yellowstone cutthroat trout still exist.

The distribution of Yellowstone cutthroat trout in the Teton Subbasin is indicated by the results of electrofishing conducted by DEQ from 1995 through 1999 as part of its Beneficial Use Reconnaissance Program (BURP) sampling. These results are summarized in Table 9; complete data are available from DEQ. All of the sampling sites were located on wadeable tributaries of the Teton River, with most streams located in the upper subbasin. Almost all salmonids collected during these surveys were cutthroat trout or brook trout even though rainbow trout,

cutthroat trout x rainbow trout hybrids, and mountain whitefish are relatively abundant in the mainstem Teton River (Schrader 2000b). At the time of sampling, all fish were identified to genus and species, and their total lengths were measured and recorded to permit determination of age classes. According to BURP protocol (DEQ 1996b), specimens of fish were routinely submitted to a taxonomist for verification of field identifications. Cutthroat trout were identified only as *Oncorhynchus clarki,* though it is assumed that they belong to the subspecies, *Oncorhynchus clarki bouvieri*, or Yellowstone cutthroat trout. For development of the 1998 §303(d) list, the beneficial use of salmonid spawning was assessed as full support if three age classes of one salmonid species, including juveniles (i.e., fish less than 100 mm in length), were present, or if at least two age classes of one salmonid species were present and the associated habitat index score was 73 (DEQ 1998b).

Table 9. The results of electrofishing surveys conducted from 1995 to 1999 in the Teton Subbasin by the Idaho Department of Environmental Quality. The number of age classes and presence of juvenile fish are reported for cutthroat trout and brook trout. More than three age classes is indicated by a + sign, absence of a fish species is indicated by a – sign, and the presence of juvenile fish (i.e., fish less than 100 mm in length) is indicated by the notation, /J.

Stream	No. of Age Classes		Other Salmonid and Non-salmonid Species Collected; Miscellaneous Comments
	Cutthroat Trout	Brook Trout	
Badger Creek	1	-	
Bitch Creek	2/J	-	Sculpin
Calamity Creek	2	-	
Canyon Creek	2/J	2+	Sculpin, longnose dace, speckled dace
Carlton Creek	1	-	Rainbow trout; 2 age classes
Darby Creek	3+/J	-	Collected near Caribou-Targhee National Forest
Darby Creek	-	2	Sculpin; collected near confluence with Teton River
Drake Creek	-	3/J	
Dry Creek	-	-	
Fish Creek	1	4/J	Mottled sculpin, Paiute sculpin
Fox Creek	-	3/J	Collected near Caribou-Targhee National Forest
Fox Creek	-	-	Sampled below Highway 33
Game Creek	-	2+	
Henderson Creek	-	-	
Hinckley Creek	-	-	
Horseshoe Creek	4/J	4/J	Sculpin; collected on Caribou-Targhee National Forest in 1996
Horseshoe Creek	3/J	2	Sculpin; collected on Caribou-Targhee National Forest in 1998

Stream	No. of Age Classes		Other Salmonid and Non-salmonid Species Collected; Miscellaneous Comments
	Cutthroat Trout	Brook Trout	
Horseshoe Creek	-	2	Collected below Caribou-Targhee National Forest boundary
Horseshoe Creek, North Fork	2/J	-	
Little Pine Creek	-	3+/J	
Mahogany Creek	2+/J	2+/J	
Marlow Creek	-	-	
Middle Twin Creek	-	-	
Mike Harris Creek	-	3/J	
Milk Creek	-	-	
Moody Creek	3/J	1	Sculpin, speckled dace, longnose dace, redside shiner
Moose Creek	-	-	
Murphy Creek	2	4/J	Sculpin
North Leigh Creek	-	4/J	Sculpin
North Moody Creek	-	2+/J	
North Twin Creek	3/J	2/J	
Packsaddle Creek	-	3/J	Collected on Caribou-Targhee National Forest
Packsaddle Creek, North Fork	-	3+/J	
Ruby Creek	-	2+/J	
Sheep Creek	-	2+/J	
South Leigh Creek	5+/J	-	Sculpin; collected near Idaho-Wyoming boundary
South Leigh Creek	-	-	Sampled below Highway 33
South Moody Creek	2+/J	2+/J	Unidentified juvenile salmonid
South Twin Creek	-	-	
Spring Creek	-	3/J	Longnose dace; collected near headwaters
Spring Creek	-	-	Sampled below Highway 33
Trail Creek	-	-	
Teton Creek	2/J	-	Sculpin; collected below Highway 33
Warm Creek	-	1/J	Paiute sculpin, speckled dace, sucker
Woods Creek	-	1/J	Mottled sculpin, Paiute sculpin, redside shiner
Wright Creek	-	-	

CULTURAL CHARACTERISTICS OF THE TETON SUBBASIN

Land Ownership and Land Use

Approximately 75% of the land in the Teton Subbasin west of the Idaho-Wyoming border is privately owned (Figure 10). Private lands comprise 66.5% of Teton County, Idaho; 72.5% of Madison County; and less than 25% of the portion of Teton County, Wyoming, located within Teton Subbasin. The state of Idaho manages 8% of the land in the Teton Subbasin, the majority of which (7.4%) is located in Madison County; federally managed lands comprise 33% of Teton County and 20% of Madison County (IAC 1996). The vast majority of federally owned land in the subbasin is managed by the Caribou-Targhee National Forest The Targhee National Forest was consolidated with the Caribou National Forest during the time this document was being written. The Targhee National Forest is now officially the Caribou-Targhee National Forest. The BOR manages the Teton Canyon from approximately Badger Creek to the Teton Dam site; the BLM manages several parcels of land, the largest of which are located in the North Leigh and Trail Creek watersheds.

The principal land use within the subbasin is cultivated agriculture (Figure 11). The National Agricultural Statistics Service reports that in 1997, 470 farms operated in Madison County and 270 farms operated in Teton County, Idaho, for a total farm acreage of 355,495 (NASS 2000). Additional statistics indicate a decline in both total farm acreage and operators in the five-year period from 1992 to 1997 (Table 10). Only 236 of the 470 farms in Madison County operated as full-time farms in 1997, representing an 18% decline from 1992. Similarly, only 156 of the 270 farms in Teton County operated as full-time farms in 1997, representing a 4% decline from 1992. Beef and dairy cattle numbers remained relatively stable from 1992 to 1997, but swine and sheep production declined dramatically. In Madison County, the number of farms reporting milk cows declined from 36 in 1992 to 21 in 1997, while in Teton County, the number of farms reporting milk cows declined from 27 to 26 (NASS 2000). While total farm acreage declined, harvested acreage and irrigated acreage increased slightly. In Madison County, the numbers of acres planted in barley, wheat and potatoes were about equal. In Teton County, the numbers of acres planted in barley were about twice the number planted in hay, which in turn were about twice the number planted in either wheat or potatoes. Land use in the small portion of Fremont County contained within the Teton Subbasin is comparable to land use in Teton County.

Land use on the forest is guided by forest wide standards and guidelines, subsection direction, and management prescriptions specified in the 1997 Caribou-Targhee National Plan (USDA 1997a). Portions of three subunits of the Caribou-Targhee National Forest are included within the Teton Subbasin: the Island Park Subsection (M331Aa), which overlaps the Bitch Creek subwatershed; the Teton Range Subsection (M331Db), which overlaps the eastern portion of the subbasin in Wyoming; and the Big Hole Mountains Subsection (M331Dk), which overlaps the Trail Creek subwatershed west to, and including, the Moody Creek subwatershed (USDA 1997a).

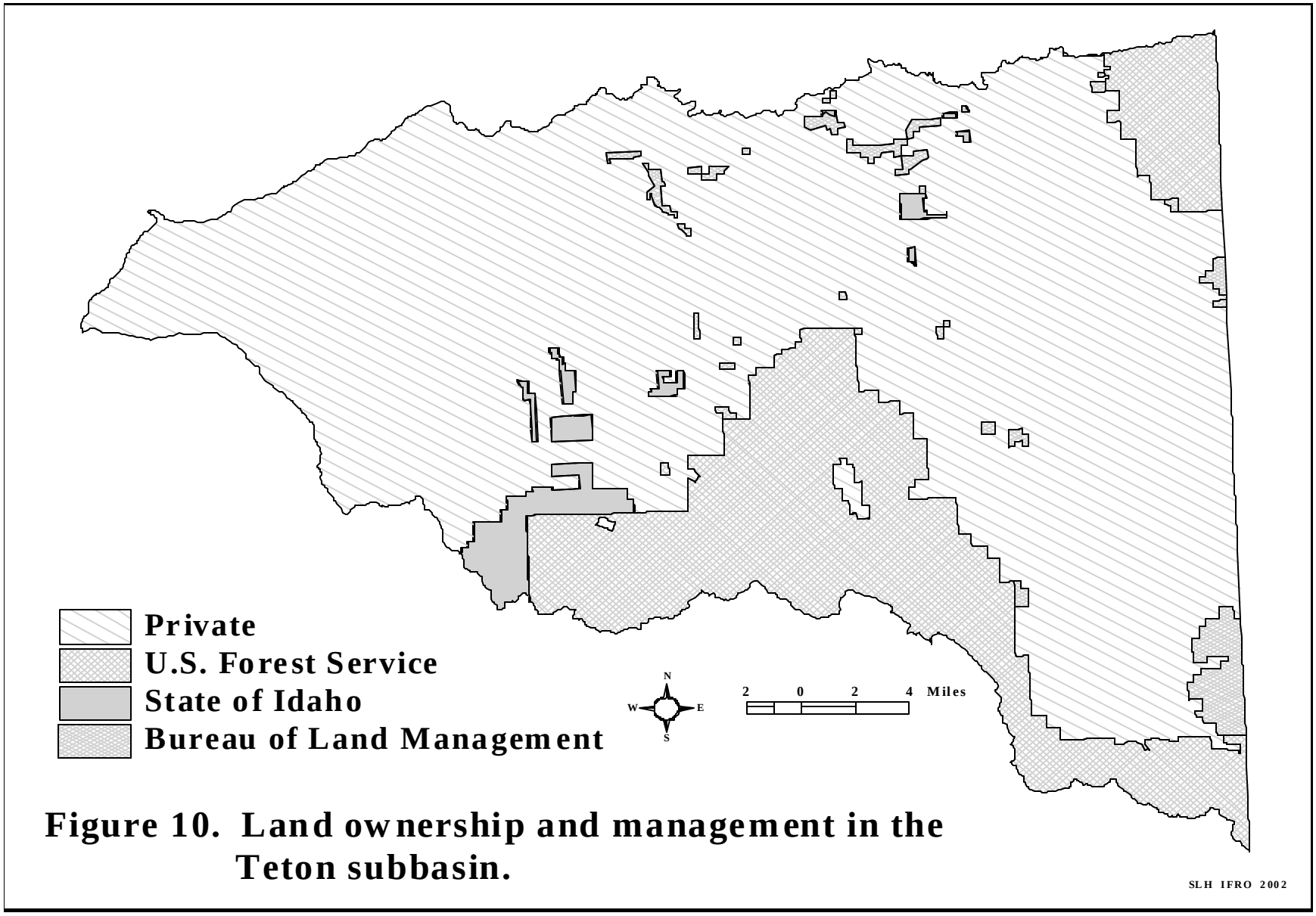

Figure 10. Land ownership and management in the Teton subbasin.

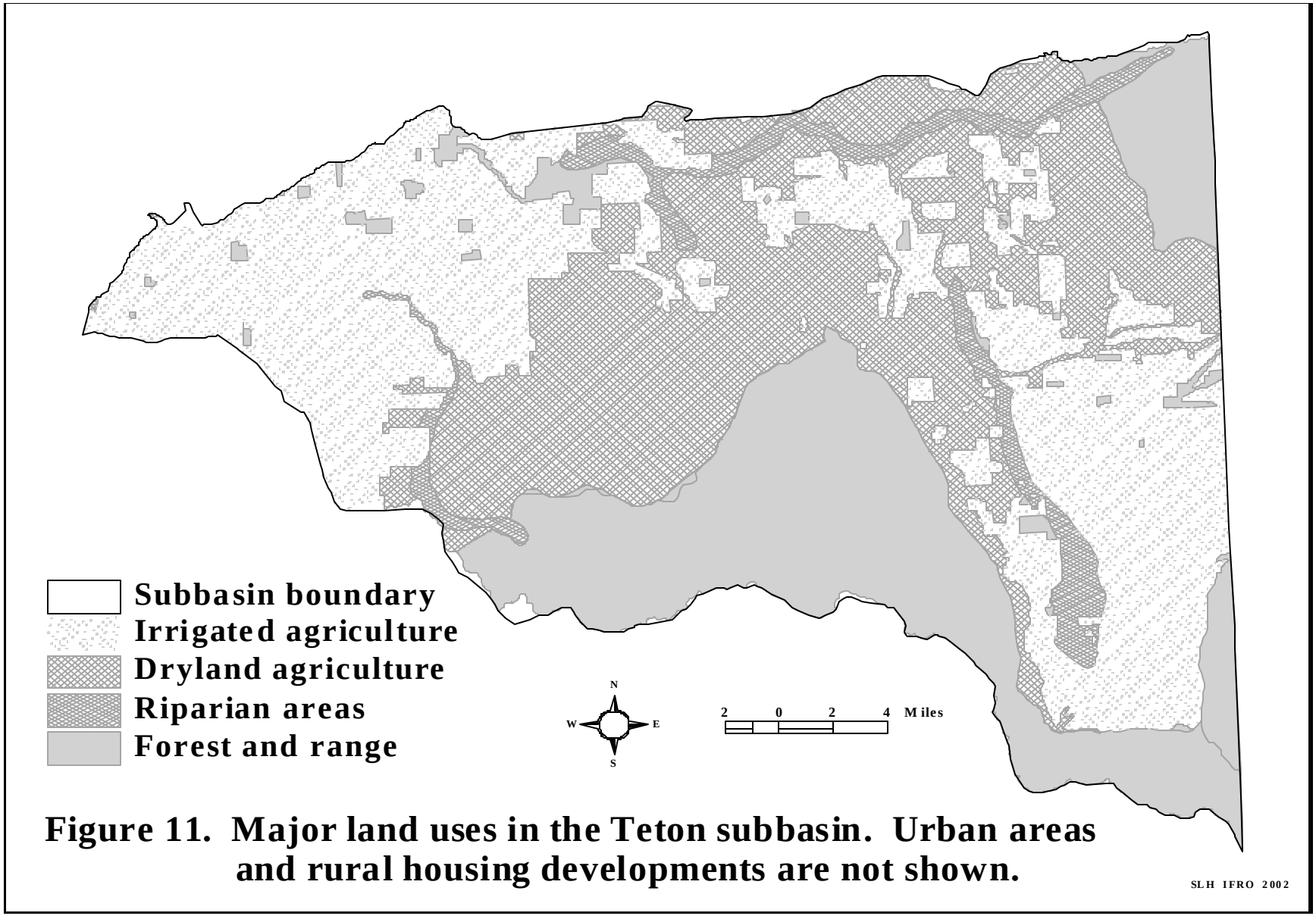

Figure 11. Major land uses in the Teton subbasin. Urban areas and rural housing developments are not shown.

Table 10. Agricultural statistics for Madison and Teton Counties, Idaho, for 1992 and 1997[1].

Parameter	Madison County		Teton County	
	1992	1997	1992	1997
Farms	505	470	257	270
Average farm size (acres)	444	474	524	491
Operators reporting farming as principal occupation (%)	57.0	50.2	63.0	57.8
Total farm acreage (acres)	224,369	222,817	134,788	132,678
Total cropland (acres)	177,049	174,147	108,283	101,862
Total harvested cropland (acres)	144,280	147,243	71,504	76,919
Irrigated land (acres)	127,851	128,649	51,358	57,273
Market value of crops ($1,000)	64,249	73,134	20,193	22,864
Market value of livestock and poultry, and products ($1,000)	8,950	7,340	6,495	5,921
Beef cows	7,824	7,104	6,598	7,477
Milk cows	1,715	1,521	1,323	1,172
Hogs and pigs inventory	1,936	123	34	60
Sheep and lambs inventory	3,254	461	D	182
Layers and pullets, broilers	D	D	D	323
Wheat for grain (acres)	37,443	45,270	9,268	4,529
Barley for grain (acres)	52,421	47,500	36,648	43,906
Potatoes (acres)	39,402	40,045	5,673	7,166
Hay – Alfalfa, other (acres)	16,179	15,890	20,014	21,914

[1]Source: NASS 2000.

[2]D: Withheld to avoid disclosing data for individual farms.

In addition to the watershed cataloging systems previously described in this assessment, the forest has designated principal watersheds that generally do not correspond to the subwatersheds shown in Figure 5 because they end at the forest boundary. The management prescriptions for each subsection and corresponding principal watersheds are listed in Table 11.

Land use on the Caribou-Targhee National Forest in the eastern portion of the subbasin, most of which is located in Wyoming, is determined primarily by its status as wilderness and grizzly bear habitat (USDA 1997a). Much of the forest is within the Jedediah Smith

Table 11. Management prescriptions for, and principal watersheds within, subsections of the Caribou-Targhee National Forest located within the Teton Subbasin, as specified by the 1997 Forest Plan (USDA 1997a).

Subsection	Major Prescription Areas	Principal Watershed Number and Name
Island Park	5.3.5 Grizzly Bear Habitat 5.4 Elk Summer Range	0211 Badger Creek (Idaho)
Teton Range	1.1.6 Wilderness, Opportunity Class I 2.6.5 Grizzly Bear Bechler Bear Management Unit 2.7 Elk and Deer Winter Range 3.2(b) Semi-Primitive Motorized 5.3.5 Grizzly Bear Habitat Out Core 5.4(c) Elk Deer Summer Range	021W Badger Creek (Wyoming) 020 Leigh Creeks 019 Teton Creek 018 Darby-Fox Creeks 017W Trail Creek (Wyoming)
Big Hole Mountains	2.1.2 Visual Quality Maintenance 2.7(a) Elk Deer Winter Range 5.1.3(b) Timber Management No Clearcut 5.1.4(b) Timber Management Big Game	0171 Trail Creek (Idaho) 022 Mahogany Creek 023/024 Canyon and Moody Creeks

Wilderness Area, which has experienced limited timber harvest but receives relatively heavy recreational use with about 60,000 visits per year. Grand Targhee Ski and Summer Resort is adjacent to the wilderness area, and is a major destination of tourists. Because much of the area is managed for grizzly bear habitat, domestic sheep grazing is being phased out. A fire management plan is to be completed by 2007 to improve bighorn sheep habitat. Objectives for fisheries, water, and riparian resources include improvement of "stream stability ratings to good or excellent by 2007 where natural conditions allow on Teton Creek, North Leigh Creek, South Leigh Creek, Moose Creek, Trail Creek, Fox Creek, and Kiln Creek where instability is management-caused" (USDA 1997a).

Management on the forest in the Big Hole Mountains is directed toward opportunities for motorized and nonmotorized recreation, reducing risks from insect and disease attack with timber management while improving big game habitat, and use of prescribed fire to improve ecosystem health. Grazing occurs on this subsection of the forest, but data on livestock numbers grazed and grazing rotations has not been obtained. Objectives for fisheries, water, and riparian resources include improvement of "stream stability ratings to good or excellent by 2007 where natural conditions allow on ...Packsaddle, Horseshoe, North Fork Mahogany, Main Mahogany, Henderson, Patterson, and Murphy Creeks" (USDA 1997a).

Population and Land Use

Based on United States census data, the population of the Teton Subbasin in 1990 totaled 27,113. Rexburg, the Madison County seat, is the largest urban area in the subbasin, followed by Driggs, the seat of Teton County. In 1990, more than 87% of the population of the subbasin resided in Madison County, and recent information indicates that the population of Madison County has remained relatively stable (Johnson undated). But in 2001, Rick's College in Rexburg, formerly a two-year college, was converted to Brigham Young University-Idaho. The population of the Rexburg area will increase as the university adds faculty and staff to accommodate an initial expansion of the student population from 8,600 students to 11,600 students (BYU 2001).

Although the population of Teton County made up a small proportion of the entire population of the subbasin in 1990, its population increased dramatically in the past decade, particularly in the Teton Valley corridor extending from south of Victor to north and east of Driggs. An assessment of trends in rural residential development in counties located within the boundaries of the greater Yellowstone ecosystem was recently completed by the Sierra Club Grizzly Bear Ecosystems Project (Johnson undated). Data indicative of development (i.e., septic permits, well logs, and building permits) were analyzed for Teton and Fremont Counties for the years 1975 through 1998, but according to Johnson (undated), data for Madison County were unavailable without direct inspection of county files and plat books. The area of Fremont County currently undergoing significant development is not located in the Teton Subbasin, so information for Teton County will be emphasized here.

The average population of all counties within the greater Yellowstone ecosystem increased 15% from 1990 to 1998, but the population of Teton County, Idaho, increased 59.6%. The population of Teton County, Wyoming, which is also within the Teton Subbasin, was second in growth among greater Yellowstone ecosystem counties with an increase of 26.8%. By comparison, the percentage change in population growth for the entire United States was 8.7%. On an annual basis, the growth rate of Teton County, Idaho, from 1990 to 1996 was 8.4%, compared to a national average of 0.9%.

The impact of population growth is evident in changing land use. According to Johnson (undated), approximately 4,000 acres in Teton County were subdivided during the 15-year period from 1975 through 1990. An additional 4,000 acres were subdivided during the six-year period from 1991 through 1997, for an average of almost 700 acres per year. The number of subdivisions created each year increased from one in 1975 to a high of 24 in 1995, for an approximate total of 150 by 1997.

Johnson (undated) found that in Idaho, water well permits did not reliably indicate rural residential trends, so septic permits were used as indicators instead. The number of individual septic permits issued annually in Teton County increased from slightly less than 50 in 1983 to a peak of approximately 180 in 1995. A total of approximately 1,300 individual septic permits were issued in the county from 1983 to 1998. However, individual septic permits do not reflect total new construction because subdivisions have three options for treating domestic wastewater: 1) connection to a municipal system, 2) construction of a community septic system, or 3) individual septic systems. Most homes in subdivisions in the Teton Valley will utilize individual septic systems, though a recently proposed development near Victor, which includes 540 housing units, intends to discharge wastewater to the regional municipal treatment system (Kirkpatrick 2000).

The municipal wastewater treatment system at Driggs was recently upgraded after 32 years of operation to allow for regionalization of wastewater treatment, and a collection system extending from Driggs to Victor was completed in 1999. This project was strongly supported by DEQ and District 7 Health Department because of concerns that sewage effluent was being allowed to seep into ground water, that septic systems in Victor were failing or had failed, and that effluent was being discharged directly to ground water (Forsgren 1998). All 350 septic systems in Victor are scheduled for conversion to the municipal system, but it is unknown how many of the systems between Victor and Driggs will be converted (Kirkpatrick 2000). The total number of individual septic systems currently in use in the Teton Valley is unknown, but according to the USDA (1969), the engineering properties of soils in the Teton Valley "pose severe limitations for septic tank systems."

An alternative to subdivision that has conserved substantial undeveloped acreage in the Teton Valley is acquisition of the landowner's development rights through a conservation easement. The landowner retains title to the property, but the easement restricts in perpetuity the type and amount of development that can occur on the property. Since 1995, the Teton Regional Land Trust, a nonprofit organization serving the Upper Snake River Valley, has obtained conservation easements on 2,725 acres in Teton County and 80 acres in Madison County, and has obtained a fee title on an additional 40 acres in Teton County (Whitfield 2000).

Planning

Goals for future growth and development in the Teton Subbasin are described in the *Madison Comprehensive Plan, December 16, 1996* and the *Teton County, Idaho, Comprehensive Plan, Amended March 11, 1996.* Ordinances that currently apply to land use include zoning and subdivsion ordinances for Teton County and the cities of Rexburg, Driggs, and Victor. Guidance for development in the small portion of Fremont County that occurs within the subbasin is subject to the *Fremont County Comprehensive Plan, 1997 Edition* and *Fremont County Development Code, 1997 Edition.*

The goals and objectives of the comprehensive plans for Madison and Teton counties are indicative of the distinctively unique economies of the lower and upper portions of the Teton Subbasin. The comprehensive plan for Madison County emphasizes the importance of agriculture to the local economy, and gives high priority to preservation of agricultural land, water supply, and the infrastructure that supports irrigated agriculture. A policy to protect and preserve the agricultural base of Teton County is specified in the Teton County comprehensive plan, but the plan also emphasizes policies to preserve and protect natural resource, recreational, and scenic values. Development guidelines are specified for wetland areas and for "critical areas of concern" such as the Teton River and many of its tributaries, hazardous areas (e.g., floodplains), and the Teton County Scenic Corridor System. There appears to be greater emphasis on the protection of surface and ground water quality in the Teton County comprehensive plan as compared to the Madison County plan, but that may be in part because of differences in floodplain mapping. A Flood Insurance Rate Map was published for Madison County by the Federal Emergency Management Agency in 1978. The Madison comprehensive plan recommends that construction and storage of hazardous chemicals within the floodplain be prohibited. Flood-prone areas in Teton County have not been mapped, though the plan recommends adoption of floodplain zoning regulations.

As noted in the previous section, almost one-quarter of the land area of the subbasin is managed by the Caribou-Targhee National Forest. Thus, forest planning is an integral component of subbasin planning. In 1997, the Forest Service issued its revised forest plan (USDA 1997a) and environmental impact statement (USDA 1997b) for management of the Caribou-Targhee National Forest through the year 2007. The plan addresses ecological components, physical elements, biological elements, forest use and occupation, and production of commodity resources. Because of the influence of the forest on the economics of Teton County, the Teton County comprehensive plan recommends "maximum cooperation and equal treatment of issues that are of mutual concern in future planning."

In 1992, the Idaho Water Resource Board (IWRB) issued the Henry's Fork Basin component of the Comprehensive State Water Plan "...in keeping with [the Board's] constitutional and legislative charge to formulate and implement a state water plan" (IWRB 1992). The plan designated approximately 48 miles of streams in the Teton Subbasin for state "recreational" or "natural" protection. All of the designated stream reaches are within the upper subbasin, and include the Teton River from Trail Creek to Felt Dam; portions of Teton, Fox, and Badger Creeks; and all of Bitch Creek downstream of the Idaho border (Figure 12).

A state recreational or natural waterway is defined by Idaho Code § 42-1731 as one that possesses outstanding fish and wildlife, recreation, geologic, or aesthetic values. A recreational waterway may include man-made development in the waterway or riparian area; a natural waterway is free of substantial man-made development in the waterway and in the riparian area. Idaho Code § 42-1734A(6) prohibits the following activities within the stream channel or below the high water mark on natural waterways: constructing or expanding dams or impoundments; constructing hydropower projects; constructing water diversion works; dredging or placer mining; altering the stream bed; and extracting mineral or sand and gravel from the stream bed (IWRB 1992).

The IWRB also maintains minimum streamflows on two stream segments within the Teton Subbasin. A minimum streamflow is the amount of water flow necessary to protect fish and wildlife habitat, aquatic life, navigation, transportation, recreation, water quality, or aesthetic beauty. Under Chapter 15, Title 42 of Idaho Code, in-stream uses can be protected under water rights held by the IWRB in trust for the people of the state of Idaho (IWRB 2001). Minimum streamflow water rights are appropriated only to the board, but any person, association, or government agency may request that the board file an application with the IDWR for such rights. At the request of IDFG, the IWRB obtained minimum streamflows on the following stream segments in the Teton Subbasin:

1. Nine miles of the Teton River beginning at the confluence of Bitch Creek and the Teton River, continuing upstream to the intersection of the Teton River with the Highway 33 bridge (SESW, Section 23, T6N, R44E); permit number 22-7369; priority date June 19, 1981; for 106 cfs year-round for fish.

2. Six miles of Bitch Creek beginning at the confluence of Bitch Creek and the Teton River, continuing upstream to the intersection of Bitch Creek and Highway 32 (NENW, Section 20, T7N, R44E); permit number 22-7370; priority date June 19, 1981; for 28 cfs.

It is important to note that a minimum streamflow water right does not guarantee that a stream will contain water. Minimum streamflows may not interfere with senior water rights, and in a drought year or when flows are low, all flow may legally be diverted for senior rights, leaving no water for minimum streamflow (IWRB 2001).